

A photograph of a flock of sheep grazing in a lush green field. The sheep are in the foreground, and the field extends to a rolling green hill in the background. The sky is filled with soft, white clouds. The overall scene is peaceful and natural.

# GRASSLANDS

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# LEARNING OUTCOMES

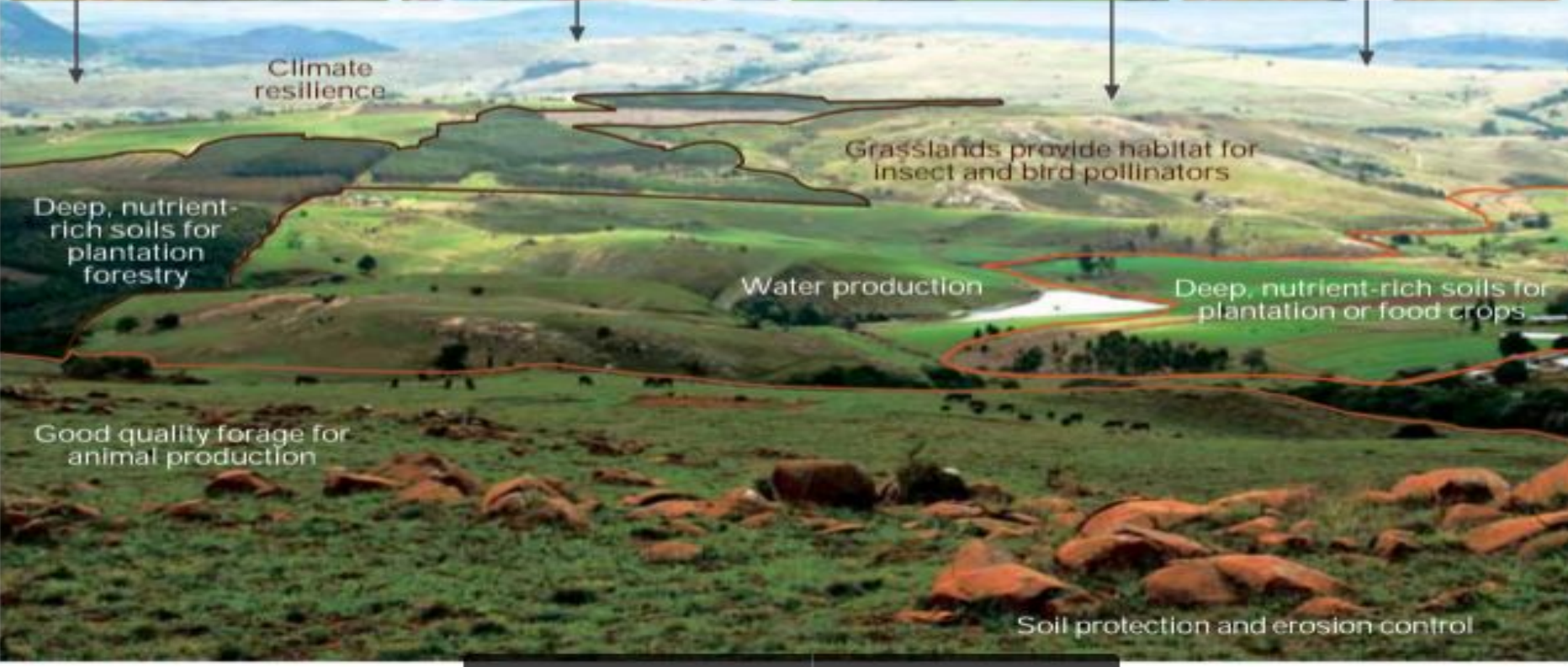
1. Introduction to Grassland ecology
2. Significance of Grassland habitats
3. Management of Grasslands

# STRUCTURE OF PRESENTATION

1. Why Grassland ecology is important to know?
2. Introduction -Distribution, Types
3. Fauna in Grasslands
4. Management of Grassland habitats
5. Experience sharing of Jaldapara National Park and Melghat Tiger Reserve

# IMPORTANCE

- Grasslands provide **vital ecosystem services** such as water and climate regulation in support of agriculture, biogeochemical cycling, carbon storage, cultural and recreational services
- Backbone of livelihoods for all the **pastoral communities**
- Several food grains such as wheat, corn, rice, and millets originated in the grasslands - important reservoir of **crop gene pool**.
- Supply **fodder** for cattle, as well as to provide the diversity from which wild crops can continue to be domesticated into agriculturally suitable crops
- **Critical habitat** for a variety of wild herbivores and other faunal groups for their breeding, migration and wintering



## Global Extent of Grasslands

### Legend

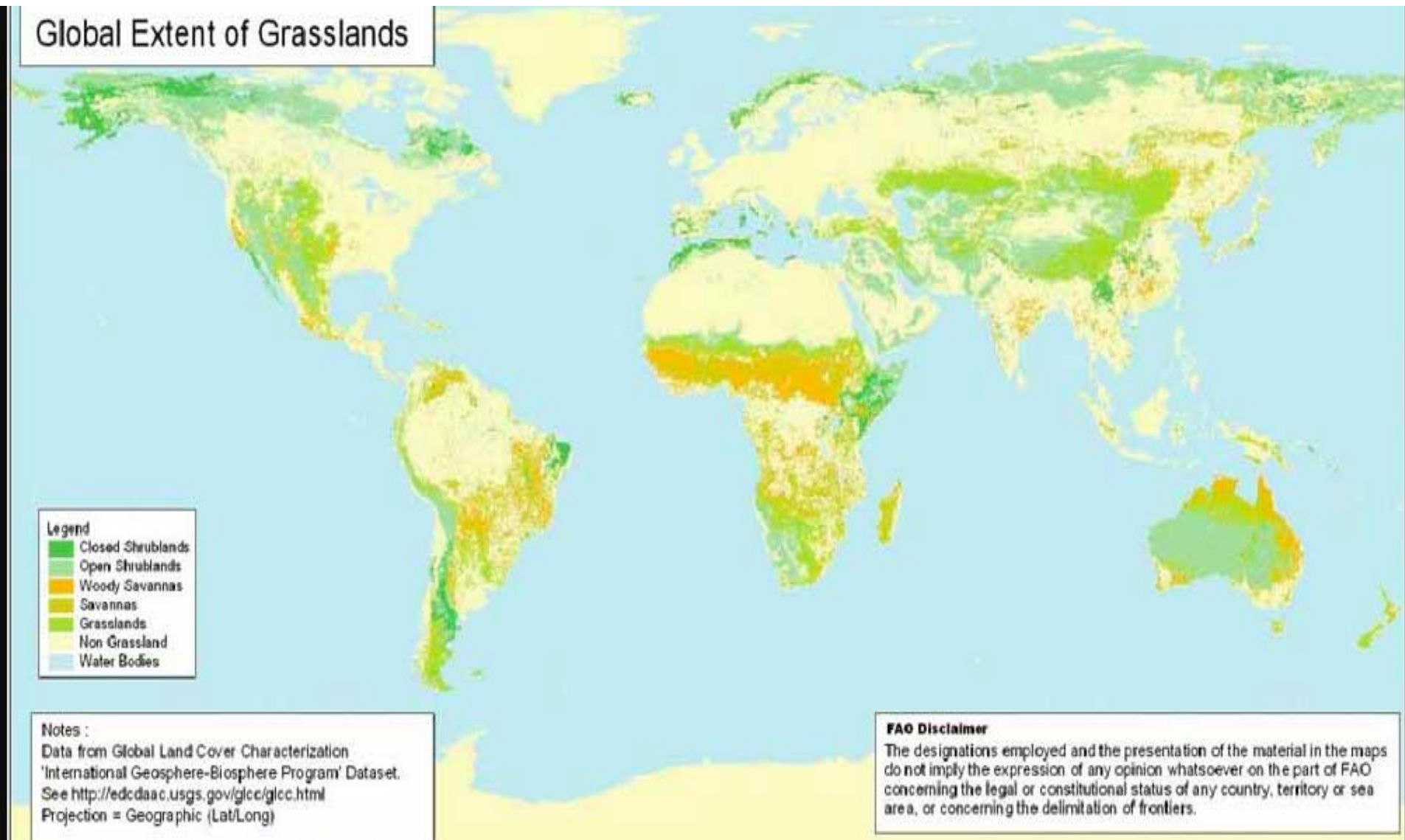
- Closed Shrublands
- Open Shrublands
- Woody Savannas
- Savannas
- Grasslands
- Non Grassland
- Water Bodies

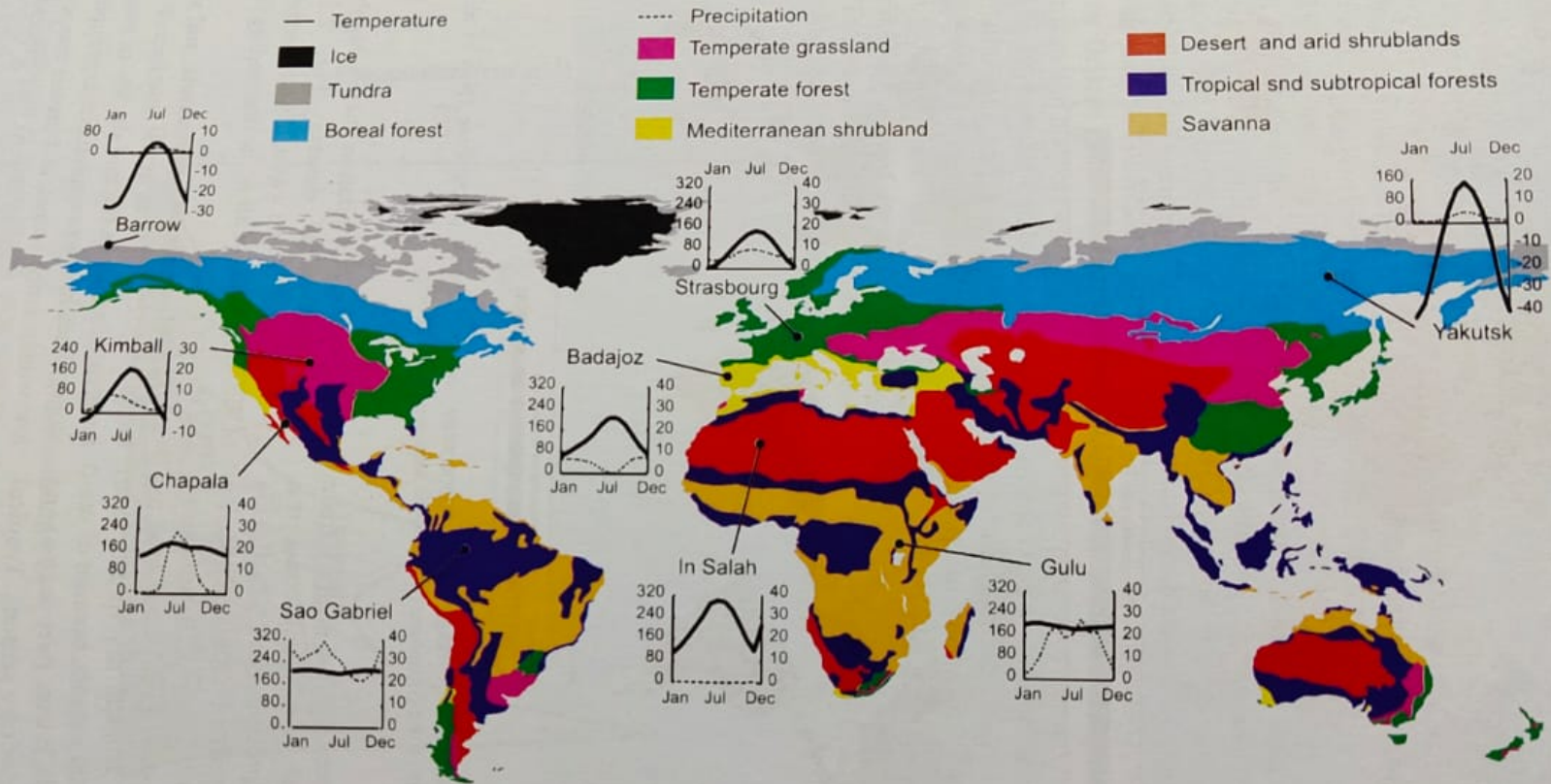
### Notes :

Data from Global Land Cover Characterization  
'International Geosphere-Biosphere Program' Dataset.  
See <http://edcdaac.usgs.gov/gicc/gicc.html>  
Projection = Geographic (Lat/Long)

### FAO Disclaimer

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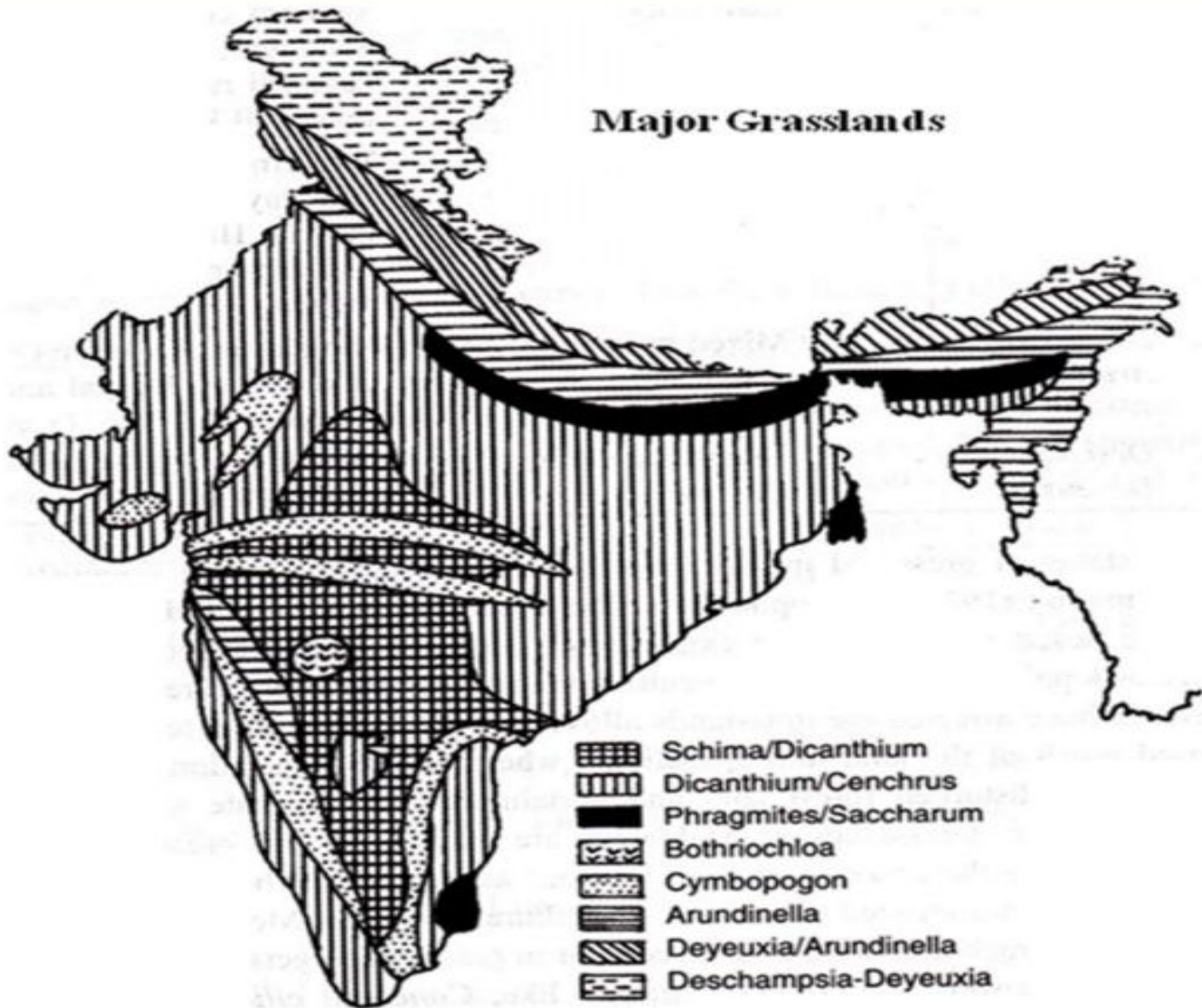
**Fig. 2.24** The global distribution of Earth's major biomes and the seasonal patterns of monthly average temperature and precipitation at one representative site for each biome. Climate data are monthly averages of the entire period of record for selected sites through the year 2000 (<http://www.ncdc.noaa.gov/oa/climate/stationlocator.html>). Map redrawn from Bailey (1998)

“Grasslands and deserts are the most neglected ecosystems by the Ministry of Environment and Forests, which looks after biodiversity conservation in India. Protection, development, and sustainable use of grasslands are very important for the rural economy and livestock. India has more than 500 million livestock; more than 50 per cent of the fodder for this livestock comes from grasslands. Many natural grasslands (e.g., wet grasslands of terai, shola grasslands of the Western Ghats, dry grasslands of Deccan, etc.) have been converted to plantations, sometimes even in Protected Areas (PAs). Some of the most threatened species of wildlife are found in the grasslands and deserts (e.g., Great Indian Bustard, The Lesser Florican, Indian Rhinoceros, Snow Leopard, Nilgiri Tahr, Wild Buffalo, etc.). Despite the importance of grasslands and deserts for biodiversity conservation, livestock dependency, and for poverty alleviation, **we still do not have Grassland Development and Grazing Policy in place.**”

First paragraph in the executive summary of the [Report of the Task Force on Grasslands and Deserts](#) submitted in 2006

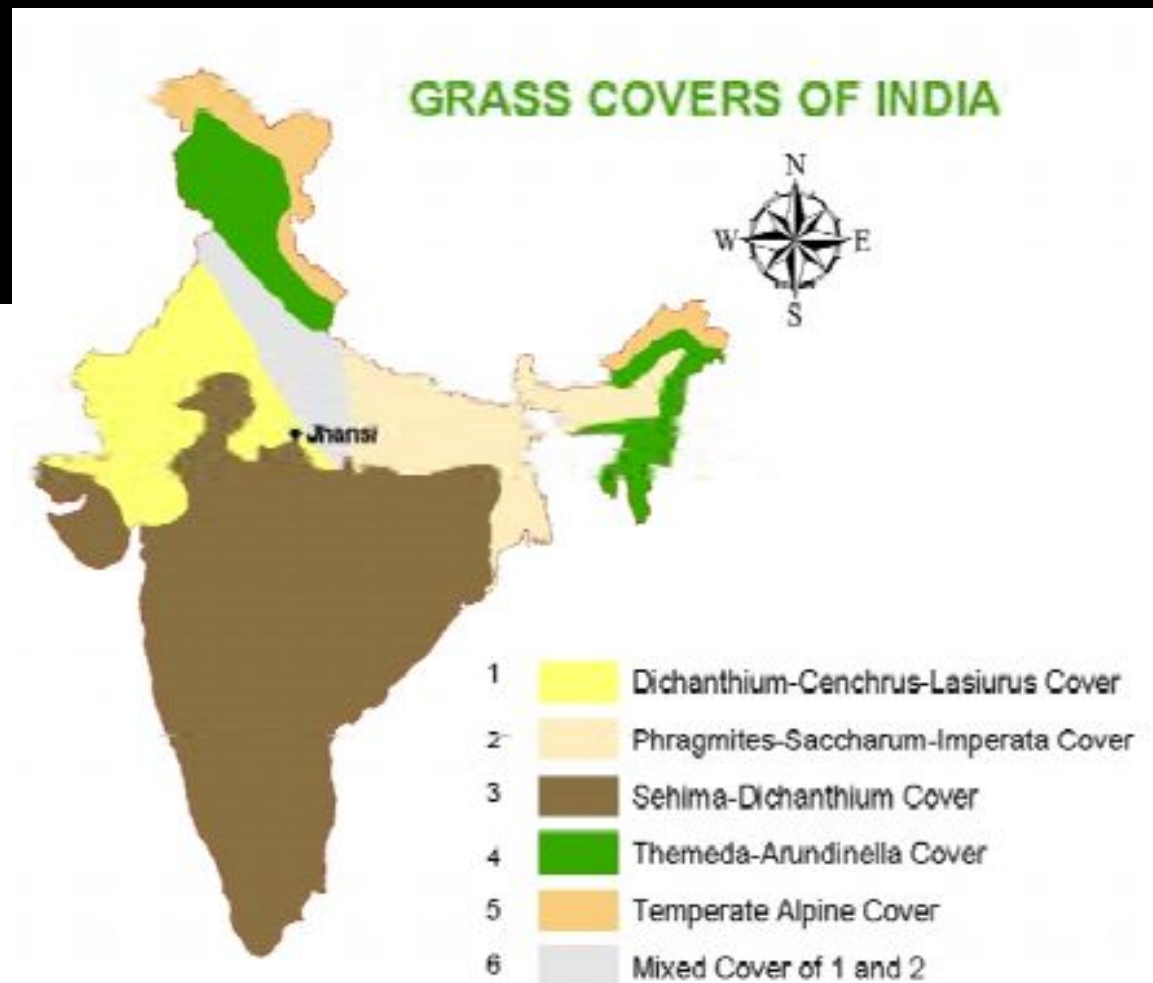


## Major Grasslands



- Between 1954 and 1962, the Indian Council of Agricultural Research (ICAR) conducted grassland surveys, and P M Dabadghao and K A Shankarnarayan in their 1973 work, **The Grass Cover of India**, classified the grass cover of the country into five major types
- Draft Grazing and Livestock Management Policy (1994) and the subsequent Draft National Policy for Common Property Resource Lands.
- **Report of the Task Force on Grasslands and Deserts** submitted in 2006 to the Planning Commission of India as part of the preparation for the XIth Five-Year Plan (2007–12)
- **The Ecology and Management of Grassland Habitats in India**, published by the Wildlife Institute of India (WII) in 2015, collated many of the findings and listed six major types of grasslands, including a number of sub-types.

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**Fig 1.** Grass covers of India

# GRASSLANDS -INTRODUCTION

A grassland is defined as a **natural vegetation composed mainly by the members of Gramineae(Poaceae)** family of plants that are grazed by livestock.

Grasslands are one of Earth's major biomes and the native vegetation of up to 40 % of Earth's terrestrial surface.

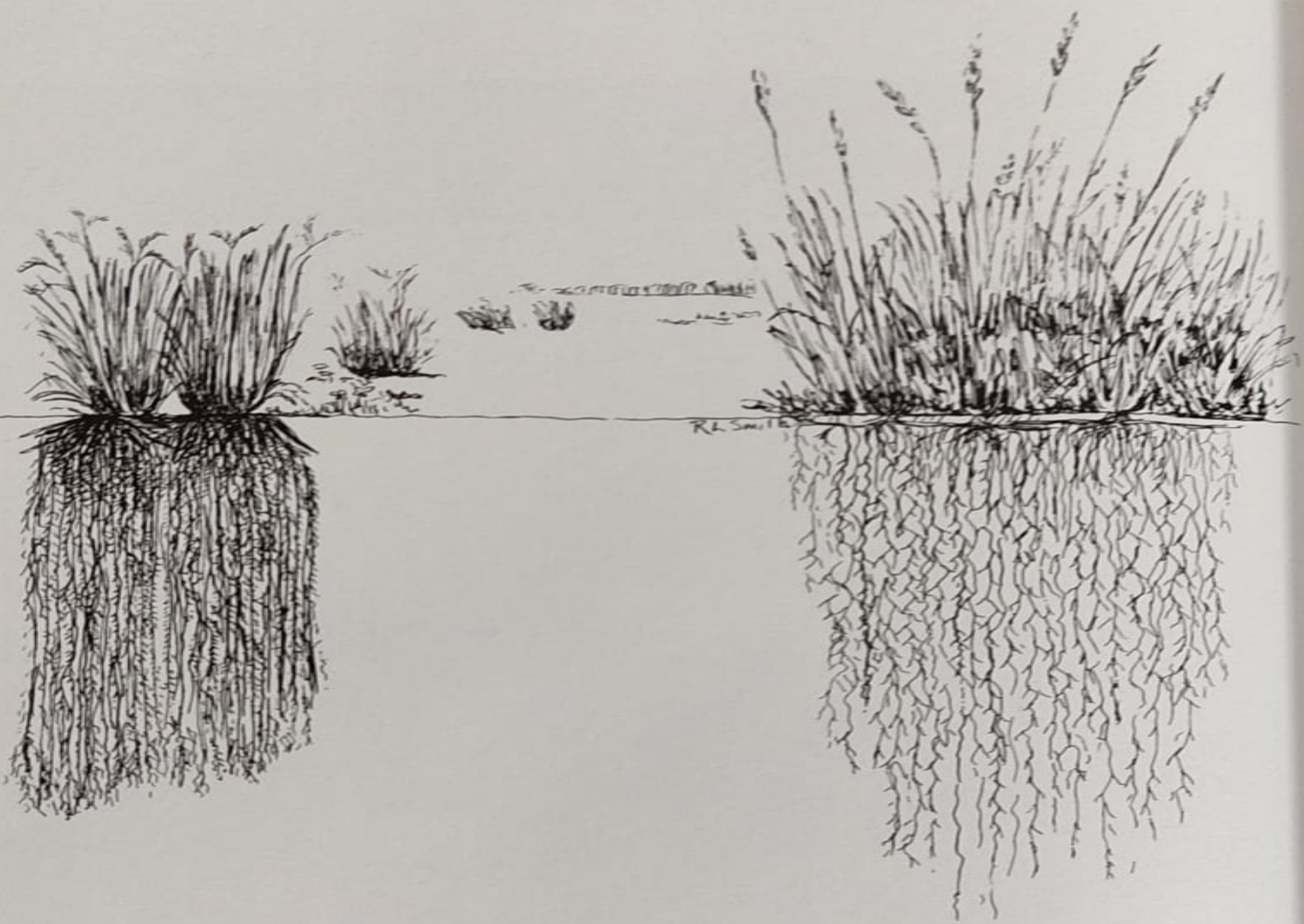
Grasslands and other grass- and graminoid-dominated habitats (e.g., savanna, open and closed shrubland, and tundra) **occur on every continent except Antarctica** (though some grasses do occur there).

# CONTD..

Grasslands are species-rich ecosystems with a variety of life forms including annual, biennial, and perennial plant species.

The defining plant species are the grasses, but these ecosystems also contain a diverse assemblage of other plant types, including forbs (herbaceous non-grasses), sedges, wetland plants, and woody plants (shrubs and trees).

- Grasses are distinctive because of their stems, called **CULMS**, produces narrow leaves that grow from their bases.
- This growth form allows grasses to be grazed or mowed with minimal mortality
- Either **sod-formers ( solid mat of grass cover the ground)** or **bunchgrasses( grow in bunches)**



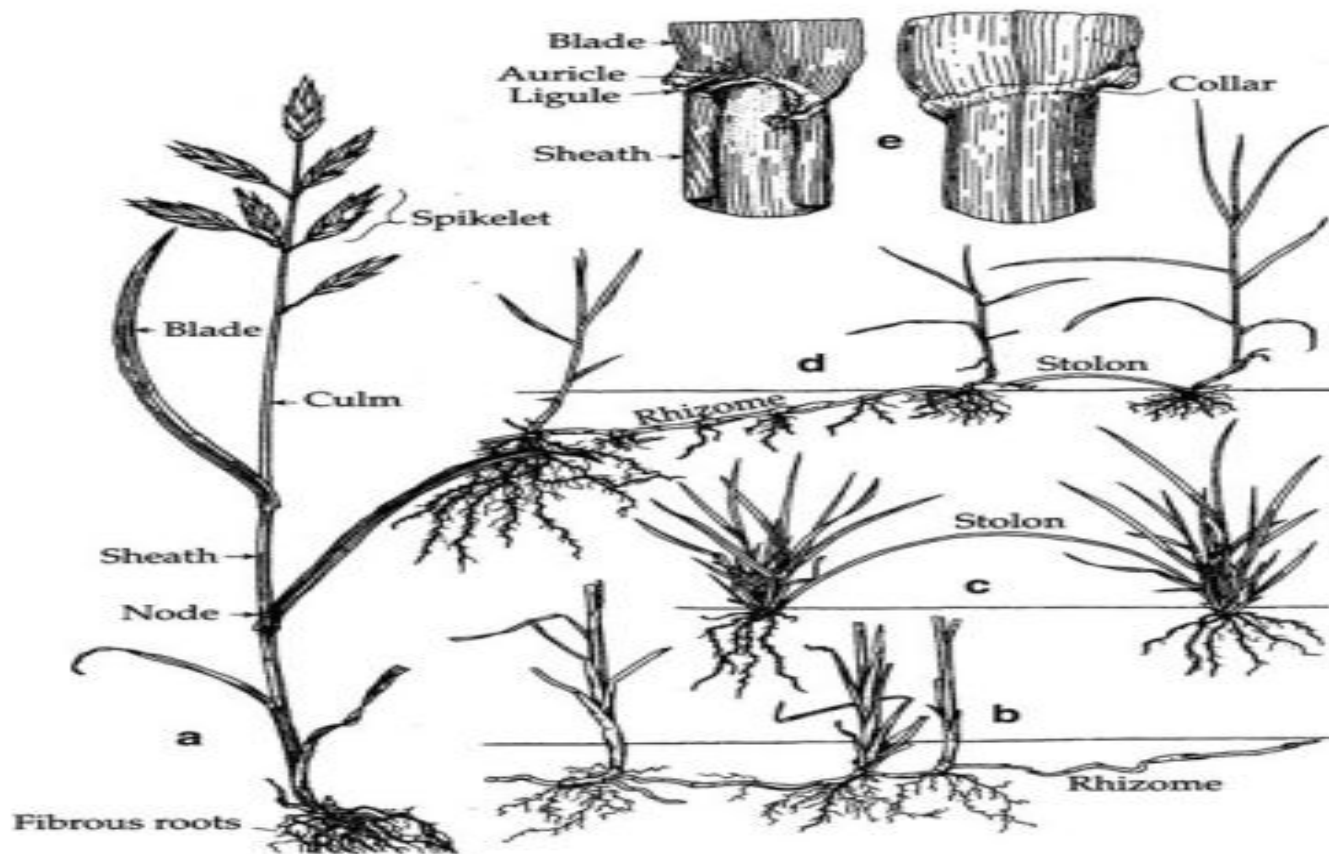
**Figure 13.1** Growth forms and root penetration (maximum depth of about 2.5 m) of a sod grass (right) and a bunchgrass (left).

Most grasslands are characterized by a **large investment in root biomass and a high root to shoot ratio**

However, the root systems of different grasslands are highly variable in terms of species-specific patterns, total biomass invested, types of roots produced, and distribution throughout the soil profile.

Many grass species share similar characteristics – fine roots that are highly branched, fibrous in nature, and concentrated in the upper soil profile (top 20–50 cm).



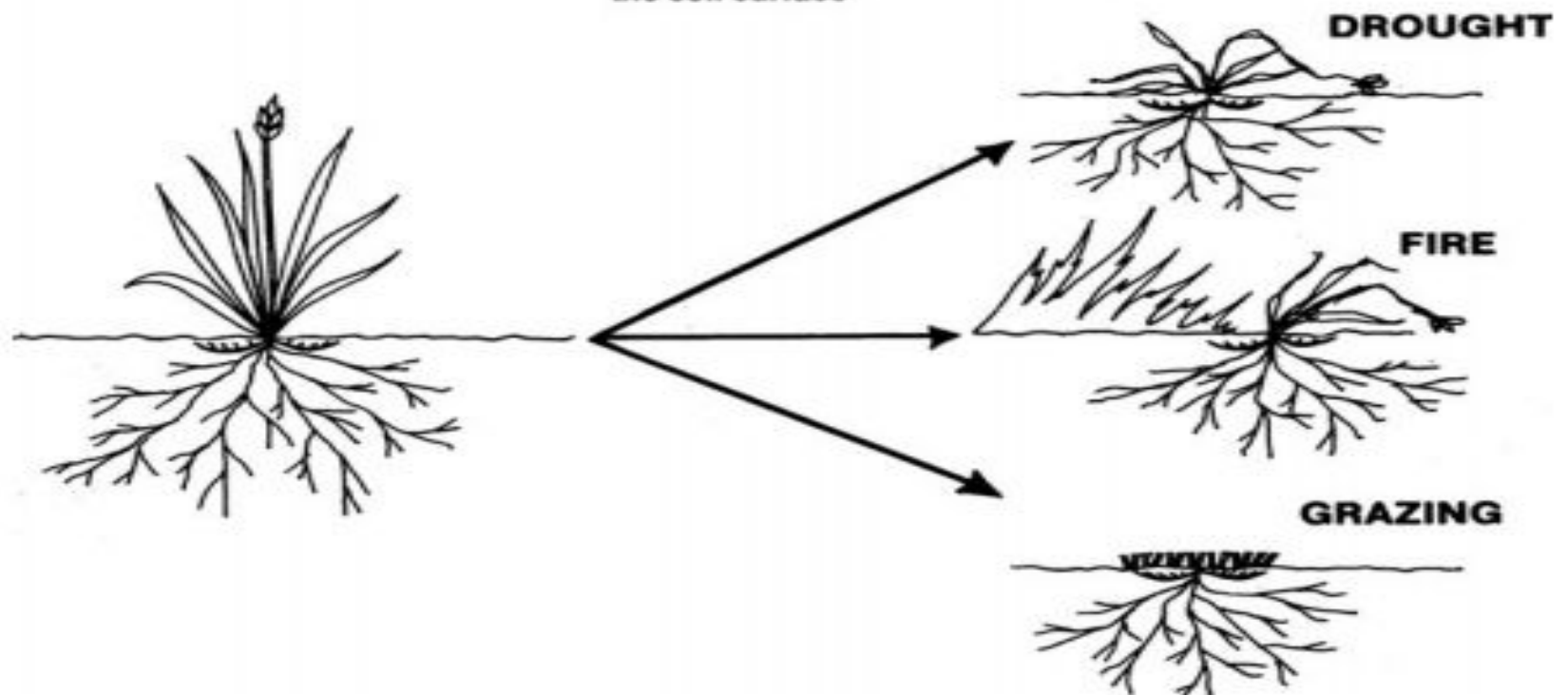


**Fig. 5** Structure of the grass plant: (a) General habit (*Bromus unioloides*); (b) rhizomes; (c) stolon; (d) rhizome and stolon intergradations (*Cynodon dactylon*); and (e) the leaf at the junction of sheath and blade, showing adaxial surface (left) and abaxial surface (right) (Reproduced from *Common Texas Grasses. An Illustrated Guide* by F. W. Gould by permission of the Texas A&M University Press)

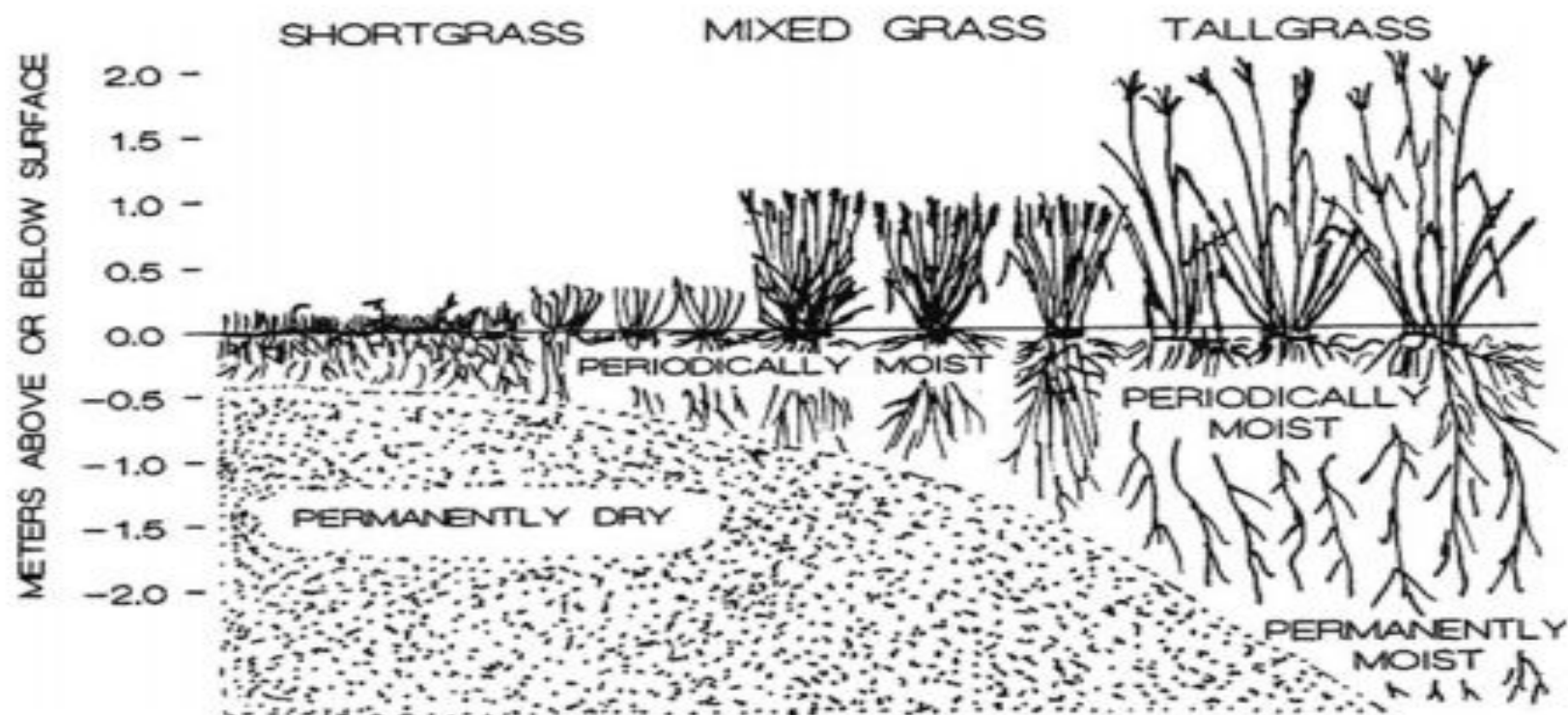
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## GRASS GROWTH FORM ADAPTATION

Protection of perennating organs beneath  
the soil surface



**Fig. 6** Belowground location of perennial meristematic tissue contributes to ability of grasses to survive and regrow following loss of aboveground biomass (From Anderson 1990)



**Fig. 10** Regional gradients in rainfall affects the distributions of major grassland types as well as mean root depth and root productivity, which in turn affect soil organic matter storage and other soil properties and processes (From Seastedt 1995)

# ANIMAL LIFE

- Exists within strata of vegetation: roots, ground layer and herb cover
- Invertebrates, particularly insects, occupy all strata at some time during the year Earthworm, Ants, beetles, predaceous spiders, Homoptera, coleoptera, orthoptera, Diptera, Hymenoptera and Hemiptera represented
- Mammals(ungulate fauna) & Avian species
- Avifauna of the Indian Thar Desert -nearly 300 species of birds have been recorded
- Only breeding grounds of a number of avian species, whose nesting time is the monsoon.

Threatened fauna of Indian Grasslands (Source: Anonymous 2006)

Species	Schedule of WPA	IUCN Status	Habitat
<i>Tibetan Antelope/ Chiru Pantholops hodgsonii</i>	I	EN	Cold Desert
<i>Tibetan Gazelle Procacpra picticaudata</i>	I	NT	Cold Desert
<i>Tibetan Wolf Canis lupus chanco</i>	I	LC	Cold Desert
<i>Tibetan Fox Vulpes ferrilata</i>	I	LC	Cold Desert
<i>Black-necked Crane Grus nigricollis</i>	I	VU	Cold Desert, Grassland
<i>Chinkara Gazella bennettii</i>	I	LC	Desert, open scrub
<i>Lesser Florican Sypheotides indica</i>	I	EN	Grassland
<i>Asiatic Wildcat Felis silvestris ornata</i>	I	LC	Hot Desert
<i>Desert Fox Vulpes vulpes pusilla</i>	II	LC	Hot Desert
<i>Asiatic Wild Ass/ Khur Equus hemionus khur</i>	I	EN	Hot Desert
<i>Asian Houbara Chlamydotis macqueenii</i>	I	VU	Hot Desert
<i>Indian Fox Vulpes bengalensis</i>	II	LC	Hot Desert, grassland
<i>Indian Desert Monitor Varanus griseus</i>	I	LC	Hot Desert, grassland
<i>Spiny-tailed Lizard Sarcops hardwickii</i>	II	LC	Hot Desert, grassland
<i>Great Indian Bustard Ardeotis nigriceps</i>	I	CR	Hot Desert, grassland

<i>Laggar Falcon Falco jugger</i>	I	NT	Hot Desert, grassland
<i>Saker Falcon Falco cherrug</i>	I	EN	Hot Desert, grassland
<i>Red-headed Falcon Falco chicquera</i>	I	NT	Hot Desert, grassland
<i>Caracal Caracal caracal</i>	I	LC	Hot Desert, grassland
<i>Golden Jackal Canis aureus</i>	II	LC	Hot Desert, grassland, etc
<i>Peregrine Falcon Falco peregrinus</i>	I	LC	Hot Desert, grassland, etc
<i>Lesser Kestrel Falco naumanni</i>	IV	LC	Hot Desert, grassland, etc
<i>Tawny Eagle Aquila rapax</i>	IV	LC	Hot Desert, grassland, etc
<i>Steppe Eagle Aquila nipalensis</i>	IV	LC	Hot Desert, grassland, etc
<i>Eastern Imperial Eagle Aquila heliaca</i>	IV	VU	Hot Desert, grassland, etc
<i>Lesser Spotted Eagle Clanga pomarina</i>	IV	LC	Hot Desert, grassland, etc
<i>Eurasian Buzzard Buteo buteo</i>	IV	LC	Hot Desert, grassland, etc
<i>Long-legged Buzzard Buteo rufinus</i>	IV	LC	Hot Desert, grassland, etc
<i>Upland Buzzard Buteo hemilasius</i>	IV	LC	Hot Desert, grassland, etc
<i>All species of Harriers Circus spp.</i>	IV	-	Hot Desert, grassland, etc
<i>Short-toed Snake Eagle Circaetus gallicus</i>	IV	LC	Hot Desert, grassland, etc
<i>Red-headed Vulture Sarcogyps calvus</i>	IV	CR	Hot Desert, grassland, etc
<i>White-backed Vulture Gyps bengalensis</i>	I	CR	Hot Desert, grassland, etc
<i>Long-billed Vulture Gyps indicus</i>	I	CR	Hot Desert, grassland, etc
<i>Slender-billed Vulture Gyps tenuirostris</i>	I	CR	Hot Desert, grassland, etc

<i>Slender-billed Vulture Gyps tenuirostris</i>	I	CR	Hot Desert, grassland, etc
<i>Eurasian Griffon Gyps fulvus</i>	IV	LC	Hot Desert, grassland, etc
<i>Egyptian Vulture Neophron percnopterus</i>	IV	EN	Hot Desert, grassland, etc
<i>Indian Wolf Canis lupus</i>	I	LC	Hot Desert, grasslands
<i>Jungle Cat Felis chaus</i>	II	LC	Hot Desert, scrub jungle
<i>Nilgiri Tahr Nilgiritragus hylocrius</i>	I	EN	Shola grassland
<i>Blackbuck Antelope cervicapra</i>	I	NT	Short grass plains
<i>Manipur Brow-antlered Deer/Sangai Rucervus eldii</i>	I	EN	Wet grassland
<i>Swamp Deer/ Barasingha Rucervus duvaucelii</i>	I	VU	Wet grassland
<i>Hog Deer Axis porcinus</i>	III	EN	Wet grassland

<b>Species</b>	<b>Schedule of WPA</b>	<b>IUCN Status</b>	<b>Habitat</b>
<i>Hispid Hare Caprolagus hispidus</i>	I	EN	Wet grassland
<i>Pygmy Hog Porcula salvania</i>	I	CR	Wet grassland
<i>Indian Rhinoceros Rhinoceros unicornis</i>	I	VU	Wet grassland
<i>Bengal Florican Houbaropsis bengalensis</i>	I	CR	Wet grassland
<i>Swamp Francolin Francolinus gularis</i>	IV	VU	Wet grassland
<i>Lesser Adjutant Leptoptilos javanicus</i>	IV	VU	Wet grassland
<i>Greater Adjutant Leptoptilos dubius</i>	IV	EN	Wet grassland
<i>Jerdon's Babbler Chrysomma altirostre</i>	IV	VU	Wet grassland
<i>Black-breasted Parrotbill Paradoxornis flavirostris</i>	IV	VU	Wet grassland
<i>Marsh Babbler Pellorneum palustre</i>	IV	VU	Wet grassland
<i>Finn's Baya Ploceus megarhynchus</i>	IV	VU	Wet grassland
<i>Asiatic Wild Buffalo Bubalus arnee</i>	I	EN	Wet grassland, Forest

\*Anonymous (2006). Report of the Task Force on Grasslands and Deserts. Planning Commission, Govt. of India, New Delhi



# MANAGEMENT OF GRASSLAND HABITATS

- As per prescriptions in Working plan, Management plan and Tiger conservation plan.
- Reports of the Wildlife Institute of India (WII), less than 1% of the grasslands come under the Protected Area Network.
- Grasslands in Reserve Forest & Protected Forest which are outside Protected area-management.
- Threats of Grazing, fire, fragmentation, deforestation, encroachment, diversion for non forest use, converting to plantations etc
- **DFOs responsibility?**

# REMEMBER TO .....

- Implementing the prescriptions of Working Plan & Management plan
- Maintenance & Restoration of Grasslands
- Special attention in conserving and improving habitat for key wildlife species ( areas in proximity to Protected Areas which serve as extended habitats of several Rare, Endangered species)
- Planning and development of Grasslands by MoU with Joint Forest Management committees
- Coordination with District Administration especially with Animal Husbandry dept. (creation of Fodder bank, silage making etc),reclaiming encroached common lands for raising grasslands
- Identification of palatable species of grasses, Seed collection, storage and raising of fodder plantation.
- Weed / invasive Alien species eradication
- **AVOID RAISING TREE PLANTATIONS IN AREAS WHICH APPEAR TO BE BLANK/WASTELANDS/GRASSLANDS**
- **& Law enforcement**

# EXPERIENCE IN JALDAPARA

## **MANAGEMENT PLAN Prescriptions**

→ Habitat Management

- ◆ Control burning (Annual Target – 200 Ha)
- ◆ Over wood removal (Annual Target – 300 Ha)
- ◆ Fodder Grass plantation (Annual Target – 60 Ha)
- ◆ Weed Eradication (Annual Target – 400 Ha)
- ◆ Removing of monoculture (Annual Target – 75 Ha)
- ◆ Reforestation 200 Ha

## 6.2.2 Management Intervention Zone

This zone constitutes main area of focus for management as far as intervention is concerned. This Park has been pioneers in manmade grassland management in the country and about 15 sqkm of artificial grassland has been created and maintained for last 3 to 4 decades. This area serves as a good habitat not only for the GIOH Rhinoceros but for several other associated grassland fauna. But, there

are challenges of weed infestation, woody succession, habitat degradation due to heavy use by different herbivores, fire and colonization by fire hardy weeds. Classification of Habitat in Management Intervention Zone is given in Figure-14 and area details in Annexure-53.

### 6.2.2.1 Objectives

- ▶ To maintain artificially regenerated grasslands and habitats as rhino habitats,
- ▶ To facilitate scientific research and monitoring to assess the impact of human intervened works in the ecosystem.
- ▶ To sanitize weed infested areas and make them available for rhinos,

### 6.2.2.2 Issues

- ▶ Weed infestation,
- ▶ Fire
- ▶ “Chicken Neck” at some places with external surrounding.
- ▶ Grazing of village cattle.
- ▶ Water scarcity during pinch period.
- ▶ Scanty availability of indigenous palatable fodder grass stock.

## 6.2.2.8 Over Wood Removal Followed By Creation of Fodder Plantation

### 6.2.2.8.1 Prescriptions

▶ Area of grass land, where grass fodder species is in the process of being suppressed by woody species and stock becomes very poor, is to be selected for over wood removal. These are transition area from low land to upland and get less frequent flooding during monsoon for smaller spans of time. Any patch having more than 60 no woody invasion per Ha should be selected for this operation.

▶ Over wood removal is to be followed by indigenous grass fodder plantation

▶ Annually 100 ha area to be selected and it should be included in annual creation of indigenous grass fodder plantation.

▶ All trees except Simul and fruit bearing species upto 60 cm girth should be removed by cutting flush to ground.

▶ Pioneer species like Sidha (*Lagestroemia parviflora*), Malata (*Macaranga denticulate*) to be removed.

▶ 60-70 No. of Simul (*Bombax ceiba*) trees above 60 cm GBH per Ha will be retained during over-wood

removal because

- ◆ This species does not form a dense canopy and hence allows grasses to grow beneath it.

- ◆ This tree bears huge quantity of flowers during the months of January to March, which supports large number of bees and insects which in turn support numerous bird species and when these flowers fall on the ground, prove to be highly nutritious fodder/food for all herbivores including Sambar (*Cervus unicolor*), Hog Deer (*Axis pocinus*), Indian Gaur (*Bos gaurus*) and Rhinoceros. Simul (*Bombax ceiba*) tree provides the very crucial highest vantage point for all raptors.

▶ Over wood removal to be done in the preceding year of the plantation.

▶ Periodic table of over wood removal is given in Table-25.

▶ Annual target under this operation is 100 Ha.

# EXPERIENCE IN MELGHAT TR

## TIGER CONSERVATION PLAN Prescriptions

- Relocation of villagers in core area – Development of Grasslands after relocation
- Removal of Weeds/Invasive alien species from the previously Cultivated sites
- Preventing establishment of woody areas
- Collection of grass seeds
- Raising of Grass fodder plantation
- Objective to increase fodder base for the wild herbivores, thereby prey base for the predators

# DISCUSSION